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GEOLOGICAL EXPLORATIONS IN SINAI.

The Topography and Geology of the Peninsula of Sinai (*Western Portion*). By T. Barron. Pp. 241; illustrated. (Cairo: National Printing Department, 1907.)

IN NATURE for September 19, 1007, we directed attention to the memoir by Dr. W. F. Hume on the topography and geology of south-eastern Sinai. We have now before us an account of the western portion of the peninsula by the late Mr. T. Barron, who was assisted in the topographical part of his work by Mr. S. T. Hardwick. This new volume does not compare in interest or lucidity with the previous one, but any defects must be dealt with gently when we bear in mind the transfer of Mr. Barron to the Sudan, and the termination of his promising career by death in that region. He has given us, at any rate, a detailed account of his observations on the topography and geology of western Sinai that will be useful enough to anyone visiting the ground, but otherwise difficult to follow. Thus, too few names are given on the geological map, and it is by no means easy to define the lines of geological section that are given in four folding plates.

The geological formations include gneiss and schists, great masses of red and grey granite, diorite, and Carboniferous Limestone and Sandstone, which together form the higher grounds of the interior. On the coast at Gebel Abu Darba there is a fringe of red granite bordered inland by Nubian Sandstone with overlying higher Cretaceous and Tertiary strata. As shown in one of the sections, this belt is separated from the main group of older strata in the interior by the plain of El Qâ, and further east by another tract of Cretaceous rocks, which are bent into a broad anticline with steep westerly inclination towards the plain, and faulted on the other side against the gneiss.

The plain of Qâ, described as a gravelly expanse, wind-swept and without shelter, is formed of a very mixed series of fluviatile, lucustrine, and marine deposits of Pleistocene and recent age, with a covering of igneous boulders from the hills and blown sand. Raised coral reefs and breccia border the greater part of the coast. Some of the sands of the plain are bound together with common salt and carbonate of lime.

The record of Pliocene strata is new. They consist of limestones with many pectens and echinids, and also teeth of *Carcharodon megalodon,* a form familiar to workers in the nodule-bed of the Suffolk Crag.

Particulars are given of the Eocene strata, with their nummulites, also of the Cretaceous divisions, and the author acknowledges his indebtedness to Mr. R. Bullen Newton for the determination of fossils from these and other strata. Some well-known European forms are recorded from the Carboniferous rocks, but, as is customary nowadays, the species are identified less confidently than in the earlier quoted lists.

The grey granite is regarded as one of the most valuable economic products, being suitable for statuary purposes. Iron and manganese ores are likewise of some importance. There are also turquoises, which, in the author's opinion, might be worked to more profit with improved methods of mining. He inclines to the view that they were formed by percolating water, the precipitate being afterwards subjected to enormous pressure. The gems occur in "pockets" in sandstone of Carboniferous age in a region that has been affected by considerable earth-movements, as evidenced by the faulting and folding.

A few remarks are made on the age of the rift of the Gulf of Suez, assigned by Neumayr and Blanckenhorn to the Middle Pliocene. The area of the gulf appears to have been a land surface in early Tertiary times, but at the close of the Oligocene or during the Lower Miocene it became depressed so as to form an arm of the Mediterranean—the Miocene fossils having affinities with the fauna of that sea and none with the Indian Ocean.

After subsequent elevation and denudation of the area, and towards the close of Upper Pliocene times, were formed the faults which bound the igneous and sedimentary ranges on either side of the gulf and the Isthmus of Suez. Subsidence then took place, and the Red Sea, which had by this time come into existence, invaded the depression. After this were produced the faults which bound the present gulf parallel to the older dislocations, and these are evidenced by raised beaches at different levels. The faults on the eastern side are somewhat older than those on the western side, as the series of beaches on the western side indicate a gradual rise after the actual fracture took place on the Sinai side. At the close of the Pliocene or beginning of Pleistocene time, submergence is again evidenced by various beach-deposits and by the brackish-water beds of El Qâ. In conclusion, the author points out that "although geologically the Gulf of Suez was in existence before the Red Sea, in point of age the fractures bounding the former are younger than those which produced the latter."

H. B. W.

A TREATISE ON AËRIAL FLIGHT.

Aërodynamics: Constituting the First Volume of a Complete Work on Aërial Flight. By F. W. Lanchester. (London: A. Constable and Co., Ltd., 1907.) Price 21*s.* net.

THE book before us is the first volume of a complete treatise on aërial flight, and is to be followed by a volume on "aërodonetics," a word coined by the author to denote the theory of the motion and equilibrium of bodies in the air. The author, by the way, is rather fond of coining new words; some of them—*aërofoil,* for example—are very happily chosen, and we hope that they may be adopted by subsequent writers on the subject. So far as mathematical theory is concerned, aërodynamics as applied to problems of flight does not differ from hydrodynamics, for with the small changes of pressure that accompany the motion of a flying machine, the compressibility of the air does not sensibly affect the motion. The first chapters, which deal with the theory of aërodynamics,

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are therefore a summary in non-mathematical language of the chief methods and results of hydrodynamical theory. They are, on the whole, very clearly written, and present in simple form all the most important points of the theory. The author is not, however, content to follow orthodox theory, but deviates from it in the treatment of several problems. Thus on p. 6 he introduces what he calls the "principle of no momentum," *i.e.* that no resultant momentum can be communicated to a fluid enclosed in a rigid boundary. Against the principle as stated no objection can be taken; but when, as on p. 16, it is applied to the motion of a body in an infinite fluid, it may easily lead to false results.

The second chapter contains an investigation on viscosity and skin friction. This has always been a subject of contention among writers on aërodynamics. Langley and Dines maintain that the tangential force on a plane moving sideways through the air is negligible, less than 0·01 per cent. of the force at normal incidence. Lilienthal, on the other hand, found the tangential force to be between 1 per cent. and 2 per cent. of the force at normal incidence, and therefore at small inclinations it may be comparable with the normal force. Mr. Lanchester, in the second chapter, brings some theoretical considerations to bear on the question, and proves that the force on a plane moving sideways varies as $v^{1\cdot5}$. This result is obtained by supposing the motion laminar, which seems to us quite unjustifiable. In chapter x. an account is given of experiments made on gliders to obtain a value for skin friction. The experiments appear to have been very carefully conducted, and considering the difficulties involved give remarkably consistent results. We hope that the author may be able to extend these experiments and so help to decide this question.

In chapter iv. the author leaves behind the solid ground of orthodox theory altogether, and attempts to work out the motion of a curved lamina or aërofoil. The importance of curved surfaces in flight was first realised by Philipps and Lilienthal. It seems to us that the author is wrong in claiming to be the first to give a theory of the motion of curved surfaces, and that Lilienthal had only a practical acquaintance with the curved form, for Lilienthal clearly realised that the effect of curvature was to diminish the eddy motion and to give an increased upward pressure due to the centrifugal force of the air. The theory has been worked out mathematically by Kutta, and his results are in fair agreement with Lilienthal's experiments. The author of the present volume attempts to work out the problem by applying the theory of cyclic motion to the motion of a surface in two dimensions, but it is difficult to see how this can have any application to the case of a lamina moving in free air. The next chapters contain discussion of various problems connected with flight; many of them are very interesting, but as they turn on the relative value of tangential and normal force, they are, in the present uncertainty as to these values, rather premature.

The last chapter contains an account of the experimental work of Dines and Langley. We could have wished that the author had extended this chapter to include the work of Continental writers such as Lilienthal, Wellner, von Lössl, &c., much of whose work is very valuable, and buried in technical journals which are inaccessible to English readers. Had he done this and excluded some of the more shaky theoretical chapters, the work might without exaggeration be called a complete treatise on aërodynamics.

SPECTROSCOPY.

Handbuch der Spectroscopie. By H. Kayser. Vol. iv. Pp. xix+1248. (Leipzig: S. Hirzel, 1908.) Price 72 marks.

THE amount of material available on the general phenomena of absorption is well known to everyone who has interested himself in this branch of science, and it is impossible to withhold admiration for the manner in which the subject is treated in the present volume. It is not easy in a short notice to discuss in detail the merits or demerits of so varied a chapter of contents as we have before us, but a brief glance will serve to show the lines followed by the author.

Whereas in the latter portion of the third volume there was given a list of compounds of known constitution, together with their absorption spectra, the first three chapters of the present volume contain an account of the absorption of colouring matters as obtained from plant, human, and animal sources. Any possible criticism of the expediency of inserting these chapters is somewhat disarmed at the outset by Prof. Kayser's preface. He was himself somewhat doubtful at first, but concluded that it would be intolerable that a book on spectroscopy should pass over these most important substances in silence. At the same time, there is no doubt that much of the work that has been published on these colouring matters is worthless; indeed, these chapters serve to show how chaotic and uncoordinated are the results of investigators in these fields.

The fourth chapter, which is from the pen of Dr. A. Pfluger, deals with dispersion, or, rather, anomalous dispersion. Herein is to be found a fine critical review of the experimental and theoretical work on the relation between dispersion and absorption.

The next two chapters, which are each about 270 pages long, deal with phosphorescence and fluorescence, the latter being contributed by Dr. H. Konen. The division of the phenomena under the two heads is based upon the criterion that phosphorescence persists for a finite time after the exciting cause has been removed. The chapter on phosphorescence, commencing with an historical account of the subject, deals in succession with the various means of excitation and the experimental methods, the influence of temperature, the spectroscopic investigation of phosphorescence, and finally the theories of the *underlying* phenomena. This chapter contains a very full account of all the work which has been carried out, and will, indeed, prove very valuable. The literature is very scattered, and this is the first time that a reasoned attempt has been made to collect and correlate the somewhat discordant details of experimental research in the domain of phosphorescence.

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